

WILLIAM MAXWELL REED MECHANICAL ENGINEERING SEMINAR

Magnetic Shape Memory Alloys

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Abstract: In recent years, magnetic shape memory alloys (MSMAs) have attracted increasing interest because of the ability to obtain one order of magnitude higher magnetic field induced strain than magnetostrictive materials and few orders of magnitude faster dynamic response than conventional shape memory alloys. They can also be used for sensing and passive power generation due to significant changes in magnetization upon the application of fluctuating mechanical forces or displacements making them truly multifunctional. However, their utility is currently limited because of the low actuation stress levels and operating temperature range, which is a consequence of the field-induced martensite reorientation being the governing microstructural mechanism for the magnetic field-induced shape change. In this talk, after a brief overview on conventional and magnetic shape memory alloys, the results of characterization of MSMAs by using a unique magneto-thermo-mechanical test setup will be presented. It will be shown that by utilizing field-induced phase transformation in NiMnGa alloys instead of variant reorientation, more than one order of magnitude increase in actuation stress can be achieved. Additionally, physical and microstructural parameters critical in field-induced phase transformation phenomena will be identified and discussed. A thermodynamical framework is also constructed and will be discussed to identify the effects of magnetic field on martensitic phase transformations. Using this thermodynamical model, guidelines to increase the actuation stress levels and possible future directions for research on magnetic shape memory alloys will be presented.

Bio: Haluk Ersin Karaca was born in Canakkale, Turkey in 1979. He graduated from Bogazici University, Department of Mechanical Engineering, in May 2001. In Fall 2001, he enrolled in Texas A&M University to pursue a graduate degree. He received a Master of Science in Mechanical Engineering in December of 2003, currently; he is a Doctor of Philosophy Candidate in the same department and expected to graduate in August 2007. During his study, he is an author of 8 published, 4 in press journal articles and more than 15 conference presentations.

Date: Thursday, March 08, 2007

Time: 3:30pm to 4:30pm (refreshments 3:00pm)

Place: 323 CRMS Bldg.

Contact: Dr. Marwan Khraisheh 257-6336 ext.80662

Meet the speaker and have refreshments
Attendance open to all interested persons



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